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DESIGN AND DEVELOPMENT OF HANDOVER IN 5G NETWORK USING THE MODULAR HANDOVER MODULES

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ABSTRACT

Handover (HO) is the mechanism used to alter the user equipment based on the mobility such that the BS that serves best will be always selected. The existing network introduces the higher failure rate and larger control overhead. Hence, the HO process in the 5G network is introduced based on the modular handover modules. The modular handover scheme consists of four different modules, as NQ (QoS) module, UP module, power module, and Decision System (DS) module. The modules, such as NQ, UP, and power module will be processed and the output attained from the NQ module, UP module, and Power module will be subjected to the Decision System module. However, the handover will be decided using these three modules based on the DS module that enabled in the network.The decision will be made optimally using an optimization algorithm developed newly, which is named as Crow Sunflower (CSF) optimization. Moreover, the comparative discussion and the performance enhancement of the proposed mechanism will be evaluated in order to estimate the effectiveness of the proposed mechanism.

I.INTRODUCTION

Due to the complexity issues of network structure, and the increasing number of the base stations, the network management system and the provisioning of services in the network system poses a challenging task in the multi tier system. Hence, new technologies are required for providing the intelligent control mechanism over heterogeneous networks (Hetnets) for effective and consistent resource allocation strategies in the security management system [9]. Due to the evolution of 3GPP's with the existing IEEE 802.11, and the Long Term Evolution- Advanced (LTE-A) standards, the fifth generation (5G) network is highly envisioned to offer 10Gb/s speed with the wider area capacity of about 1000 times and saves the energy of 90% per service when it compared with the traditional 3GPP system. 5G can support the ultra high multimedia interactive, vehicle connectivity, visual communications, industry automation, and some other applications in order to achieve the real Internet of Everything [2]. In the past decades, the growth of intelligent terminal and the traffic of mobile data lead to the evolvement of LTE network, which failed to satisfy the requirements of multimedia services. However, the next generation 5G network should outperform the LTE network with respect to the factors, like connection speed, spectrum utilization, and system capacity [1]. To offer seamless experience for users and high

coverage rate, the 5G network is highly expected to densify the HetNet by integrating the LTE with the radio access network and WLAN in order to provide the communication solution [2].

The future network structure are envisioned to integrate various network technologies, like 5G cellular network, WLAN, LTE, and microwave access (WiMax). The network architectures are expanded to meet the requirements of users in order to reduce the cost for users and operators and to ensure the services [10], and to allow the user to have flexible mobility [1]. The 5G users can leave from the cell and join to other cell with reduced size introduces the handover latency in the 5G network. However, the future applications in the 5G networks, like tele-operations, and interactive gaming required the latency in 5G that is to be the order to magnitude with the round trip time as 1 ms [2]. Due to deployment of smaller cell, various access points (AP) and users in the 5G network need to perform frequent mutual authentication when compared with the 4G network that prevents the man in the middle, and impersonation attacks. However, the resource and the power constraints of the small cell points need efficient authentication procedure to achieve handover process and low complexity. Hence, efficient, robust, and faster privacy protection and the handover authentication methods are introduced for the 5G network [9]. Among various 5G network techniques, the ultra-dense network (UDN) offers better network capacity by reducing the distances [14] [11]. The network densification in 5G means better handover rate, and higher inter cell interference that brings larger control overhead, and greater failure in handover rate [7]. However, densifying the access points is viewed as the promising solution for increasing the capacity of the system in 5G network [1].

Various studies are conducted for quantizing the performance of handover in the dense network using the stochastic geometric model [12] [13], which states that the rate of handover is increases based on the density of base station (BS) [4]. Handover (HO) is defined as the process of altering the user equipment based on the mobility such that the BS that serves best will be always selected. One simple and popular rule used to determine the BS is carried out using the signal strength of the received signal. HO is the core element of the cellular networks that supports the user mobility. Moreover, HO is the most research point to be focused in the view of the cellular networks. However, increasing the modeling the performance of HO is extensively to be addressed using the literature works of cellular network [6]. Hence, increasing the mobility becomes a significant role in the dense network. However, HO is the complicated pattern in the multi connectivity (MC), as HO involve the changes in AP in the user's vicinity [4]. The cell dwell time is effectively characterized in [6] with respect to the hexagonal and cellular shaped cells. The analytical model based on the application oriented signal strength tuning model is described in [16] that help to optimize the vertical HO. The signal overhead reduction algorithm is introduced in [17] [18] for two tier network, and in [19] for the heterogeneous network. The HO management approach based on the self organizing map is proposed in [20]. Various other techniques are studied in [15] and [16] for two tier and multi tier cellular network [6].

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II.LITERATURE SURVEY

Authors	Methods	Advantages	Disadvantages
Danyang, L *et al.* [1]	Modular handover mechanism	It effectively reduced the frequency of handover and maintained the level of user satisfaction.	The time required to complete the execution process was high.
Cao, J *et al.* [2]	Efficient group based handover authentication mechanism	It outperformed the standard methods and other relevant protocols with respect to the bandwidth consumption and signaling overhead with highly robust HO security requirements.	It may compromise or loss various group HO authentication messages in the authentication process.
Polese, M *et al.* [3]	Dual connectivity protocol	It increased the performance of end-to-end network.	Due to the insufficiency of the measurements in the correlated mmWave channel, it was highly complex to generate an accurate model in the mobility scenario.
Zhang, H *et al.* [4]	Anchor-based multi connectivity (MC) model	It enhanced the robustness of user mobility.	The AP density as well as the user velocity was needs to be modified in order to achieve a tradeoff between signal overheads and handover rate.
Oh, S.M *et al.* [5]	Enhanced inter beam handover (IBH) scheme	It reduced the signal overhead.	However, the performance of the system was poor.
Arshad, R *et al.* [6]	Topology aware Skipping Approach	It effectively attained maximal gains at higher BSs intensities.	The average throughput generated was very less.
Zhang, H. and Huang, W [7]	Tractable mobility model	It reduced the cost based on the factors of handover in the dense networks, by deriving the	The performance of the multi-connectivity model was not revealed from various cell.

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		compact expression of network performance.	
Yan, L *et al.* [8]	Inter small-cell handover approach	It enhanced the flexibility and capacity of network	Synchronizing the various C-plane signaling with the U-plane data poses a challenge.

III CHALLENGES

- In [3], A Dual Connectivity Model Was Developed That Enable The Ue Devices For Maintaining The Network Connections In The 4g And 5g Network. Due To The Insufficiency In The Measurement Of Correlated Mmwave Channel, Developing An Analytical And Accurate Model For Mobility Poses A Challenging Issue.
- Due To The Excessive Ho Rate, The Network Results Negative Impact In The Densification Of Cellular Network, Which Results A Major Challenge In The Traditional Network Structure [6].
- Due To The Inference Constraints And The Transmitting Power In The Access Link, Allocating Too Mush Bandwidth To The Backhaul Network Poses A Challenging Task [11].
- To Establish The U-Plane From The Old Data Without Causing Any Interruption In The Ho Process Results A Major Challenging Issue In The Ho Mechanism [8].
- The Inter-Beam Ho Mechanism Used To Perform The Scheduling Process Increases The Performance Of Ho In The Inter Cell Network Such That To Use The Mmwave Communication System In The Inter Beam Ho Poses A Challenging Issue [5].

IV. PROPOSED METHODOLOGY

The primary intention of the research work will be to enable the effective handover in 5G network. The modular handover scheme consists of four different modules, as NQ (QoS) module, UP module, power module, and Decision System (DS) module [1] [21] [22]. Initially, the modules, such as NQ, UP, and power module will be processed. Moreover, the output attained from the NQ module, UP module, and Power module will be subjected to the Decision System module. Each of the modules will be defined for any function in such a way that the handover complexities will be reduced. The QoS of the individual candidate wireless network will be managed by the NQ module, and the UP module will be concerned with the user individualization preference indicators, whereas the power module will concentrate on the power. Hence, the handover will be decided using these three modules by the DS module will be enabled in the network. However, it will be effectively decided whether to provide the handover in the 5G network or not based on the output attained from the DS module. The decision will be made optimally using an optimization algorithm developed newly, which is named as Crow Sunflower (CSF) optimization that will be modeled newly using the crow search optimization (CSA) [23] and sunflower optimization (SFO) [24]. Moreover, the handover mechanism will be simulated using the NS-3 simulator tool. The performance of the proposed handover mechanism will be evaluated using the evaluation metrics, such as

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handover number, throughput, and user served ratio, respectively. The comparative analysis will be made by comparing the proposed handover mechanism with that of the existing techniques, like [1], [4], and [5], respectively. Figure 1 shows the block diagram of the proposed handover mechanism.

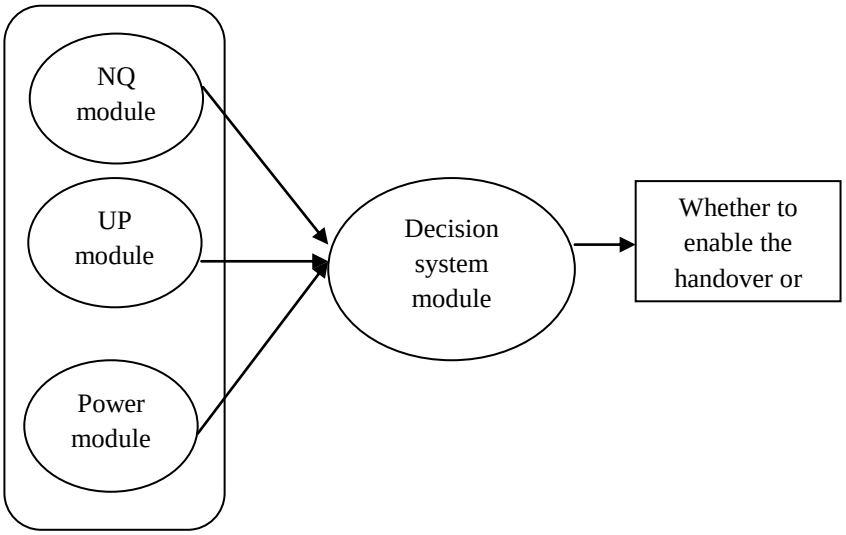

Figure 1. Architecture of the proposed handover model

V. RESEARCH OBJECTIVES

- To design the handover mechanism in the 5G network based on the modular handover module.
- The decision to provide the handover in the 5G networks is enabled using the CSF optimization algorithm.
- To evaluate the performance enhancement of the proposed mechanism with that of the existing methods based on the evaluation metrics.

6. EXPECTED OUTCOME OF THE RESEARCH

- The proposed handover mechanism will extremely outperform the existing one with the decision module.
- Attain maximal performance by generating higher throughput in the handover module.
- It will be highly robust, accurate, and more efficeint in the 5G network.

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